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NOTES ON THE SO-CALLED PARALYSIS TICK, IXODES PILOSUS.

By C. W. Mally, Entomologist for the Eastern Province.

The farmers around Carlisle Bridge have no doubt whatever that the tick (*Ixodes pilosus*) is responsible for the malady in sheep, especially of the merino type, popularly known as "Paralysis." Hence the term "Paralysis Tick." "You need not investigate whether or not the tick is the cause, we know that already; just tell us how to get rid of the tick?" Their belief rests on the following facts:

Soon after the first frost (about the middle of May) the sheep become paralyzed, *i.e,,* they are found lying on the veld unable to get up or help themselves in any way. They may try to get up and if placed on their feet may move off a short distance and then drop. If they are just becoming affected they show a peculiar stiffness in the legs and if you attempt to drive them or excite them in the least, they drop as if exhausted. They are usually lingering behind the main flock, or lying down, and are loath to make off promptly when you approach, often allowing you to come very close, as if hoping that you had no designs on them and would pass on without disturbing them. The farmers insist that every sheep so affected is invariably infested by the tick in question, *Ixodes pilosus,* and that it will recover promptly if the ticks are removed. If the sheep still lingers after apparently all of the ticks have been removed it is a sure sign that a tick has been missed. One tick is considered quite sufficient to cause paralysis. You must hunt till you find the tick! No small task when the wool is long.

Ticks were found on every case that came under observation. On one lamb which Mr. Borthwick, Government Veterinary Surgeon, had under observation, no ticks could be found; but when the skin was removed for *post-mortem* purposes, the characteristic inflamed spot was found and on searching the wool at this point they found the tick!

Long Grass and frost seem to be the two essential conditions. The disease does not occur in the "short veld," or veld that lies high, but always in the "best veld," *i.e.,* in a ravine with considerable bush and long grass, veld that has been "understocked." From the middle of May to the middle of July is the worst time. Mr. Frank Bowker declares that the disease occurs only once in two years, this being his experience during the last ten years.

The tick *in itself* is not the cause of the disease, for I found it on sheep that were apparently in perfect health, though running in the "dangerous" veld. Thinking that perhaps the sheep in that veld had gradually become immune, I examined a healthy flock on Mr. Christoffel Nel's farm (about one half hour from Mr. H. D. Gradwell's farm, where the chief observations were made) and found the ticks, in several cases as many as five on a sheep. Specimens were carefully isolated and submitted to Mr. Lounsbury for determination, along with specimens from Mr. Gradwell's farm. He finds them to be identical. This fact is not without precedent, for we find "Bont Ticks," (*Amblyomma hebraeum*) on sheep that show no signs of heartwater. Similarly, the fact that one tick is considered sufficient to paralyse a sheep has a precedent in the fact that one infected Bont Tick nymph is quite capable of conveying virulent heartwater. It may be that as yet only a small percentage of the ticks are infected, Females that have been attached for some days, and hence waiting for the male, are invariably designated as the paralysis tick. This would indicate that only the adults convey disease the same as in *Hemaphysalis leachi*. The fact that the disease is co-incident with the return of cold weather seems to be the reverse of *R. appendiculatus* which Mr. Lounsbury has found to convey African Coast Fever under conditions of high temperatures. That opposites must be expected is shown by the fact that in *A. hebraeum* the female seeks the male, while in the present instance (*I. pilosus*) the male seeks the female.

The farmer can give no information about the tick after July. Their impression is that it is not on the sheep after the paralysis months. The sheep have never been carefully examined after paralysis ceases. But the tick has never been noticed at shearing time. The only way to settle that point is to visit the infested farms and search for ticks at least once each month, throughout the year.

Mr. Borthwick found that, with care, paralyzed sheep would recover even though the ticks were not removed, but recovery seemed to be somewhat retarded.

That recovered sheep are not immune is shown by the fact that one of those which Mr. Borthwick had under observation became paralyzed again when returned to the veld, but not so severely as before. It still carried some of the ticks that were on during the first attack.

Young lambs that have never been out of the kraal and get no food except the milk from apparently healthy mothers get the ticks and develop the same symptoms as do the sheep that run on the veld. (This would seem well nigh conclusive if it were not for the disquieting possibility that the long succulent grass becomes unwholesome after it is nipped by frosts. We often hear complaints to that effect in some of the Western States after the first heavy frost. The ewe might be resistant and the lambs affected through the milk. I did not have a good opportunity to test the matter by feeding a clean lamb on a ewe with a paralyzed lamb.) One cross-bred Persian lamb which had been under observation for two days showed typical heartwater lesions on *post-mortem.* At Mr. Frank Bowker's one lamb died and one was recovering after the removal of the ticks.

Several cases of paralysis that I had under observation seemed to develop heartwater. Their *actions* were characteristic of heartwater. None of them died, but one from which I had removed two ticks was slaughtered to end its misery. We located an additional tick while skinning the sheep. There was nothing to indicate disease except an excess of fluid in the pericardium and it was not the usual colour for heartwater.

Mr. Gradwell finds that by dipping paralysis flocks in the usual strength of Cooper's Dip the disease is checked at once. The paralysis flock had been dipped a few days before my arrival and I went over them very carefully for live ticks but failed to find one although dead ticks were common. A fortnight after the dipping I found an engorged female on the chin of one of the sheep. I found two newly attached females about a week after the dipping but they were dead two days later. This indicates that it not only kills the ticks but protects the sheep for some time, there being no cases of paralysis after three weeks. Twenty sheep from this flock had been reserved by Dr. Borthwick for experimental purposes. They were "dosed" with Cooper's dipping powder at the same time the others were dipped. Each sheep received a teaspoonful of one part dip to ten of salt. No cases of paralysis were found for some time and it was thought that the dosing might have a protective effect. Two cases were found after a week. One was dead and the other died a few days later. While this shows that dosing once with Cooper's dipping powder is not effectual, it indicates that dipping is a success, and points to the responsibility of the tick, for it is the only factor that is eliminated by dipping. The only new factor that could be introduced is whether or not enough of the dipping material is absorbed through the skin to have a protective effect. If so it must exceed the amount directly administered by dosing.

If the whole flock cannot be dipped, it would be a good plan to arrange a small tank and dip each sheep as soon as found. This would kill all the ticks at once and save time and labour. But the great difficulty of finding and bringing in the paralyzed sheep still remains.

It soon became apparent that the only way to put the tick phase of the matter on a reliable basis was to get a number of engorged females for egg-deposition and from them start the necessary experiments for a satisfactory demonstration. I therefore spared no effort to collect engorged females. This was no easy task, for the ticks were not abundant, and the farmers were very loath to allow the ticks to remain long enough to become engorged. One farmer said it went "decidedly against the grain" for him to leave them on for even a moment. Among the native herdsmen, leaving the ticks on is considered a sure sign of madness. On June 16th I examined a flock of about 600 sheep just as they were being dipped and, while quite a number of ticks were present, only one engorged female was found. I examined large numbers of sheep in different flocks, but always with the same result:—only one or two ticks at a time. At Mr. Gradwell's the twenty sheep that were reserved by Mr. Borthwick were examined morning and evening, and the engorged females carefully removed. In this way I secured 32 nicely engorged specimens.

The female ticks prefer to attach themselves around the mouth, under the chin and throat, on the bare patches under the legs and along the edges of the wool, in the wool on the legs, along the belly and near the udder. The males are very scarce and when not attached to the female are usually wandering about. On two occasions I found a male attached to the skin, but he remained only a short time. Judging from appearances, the female is ready for the male after she has been attached only a few days. She can evidently wait for him all but indefinitely, increasing in size very slowly as time goes on. One female marked by Mr. Borthwick, June 4th, did not engorge till the morning of the 18th. When pointed out to me, June 10th, she was still the same size as when first noticed. To have attained the size she was she must have attached at least a week before the 4th. A male was captured on another sheep and placed with this female, June 12th. He remained in position three and one half hours and then attached close by, apparently feeding. After another hour he had disappeared. The female showed no change till the 17th. It may be that another male intervened. Other females marked, June 11th, were still unchanged, June 20th. In two instances the females came off very easily. On examination it was found that a small bit of the skin was sloughing off with them. How long they had been waiting it is impossible to say. In several cases the male remained with the female about 24 hours: but since they were not under constant observation it is possible that it was not the same one. When once the female is partly engorged she fills out very rapidly and drops easily. This no doubt accounts for the difficulty in getting engorged specimens. They are very delicate after engorgement and for that reason it was thought best not to subject them to the rough journey by Post Cart. They were therefore carefully placed on damp soil in glass bottles plugged with cotton wool and left in Mr. Gradwell's care. To send them by post cart would have been courting disaster. Specimens carried about on the veld when searching for paralyzed sheep usually turned black and died without showing any signs of egg-laying. It was a common occurrence to find specimens that had become entangled in the wool after engorgement and died. The plan is to wait till the eggs hatch and then send the larvæ in the hope that in their unfed condition they will be hardier.

Engorged larval and nymphal ticks were found in the ears of some of the sheep, but they were scarce. A son of Mr. Henry Nel says that sometimes he can find no ticks except those in the ears and that they must be removed before the sheep will recover. In two instances a larger nymph was found on the side just behind the shoulder. Aside from that I found no immature ticks of any species.

No other species were found except an occasional Bont, *A. hebraeum,* a few Reds, *R. evertsi,* mainly males, and a few Blues *R. decoloratus.*

The farmers think that the long grass favours the tick, either by affording the necessary shelter, moisture, etc., or else by making it easier for them to get on to the sheep. Even if true it would only have an indirect influence on the question of their conveying disease. Five sheep (three merinos and two cross-bred Persians) were accordingly placed in a small area used mainly for cultivation. In the centre is a ravine in which the grass is much longer than on any of the veld —not having been grazed except when a horse was turned in for a few hours. They showed no signs of the disease after a week and on close search only one tick was found on one of the Persians. The sheep seemed lonely and grazed mainly on shorter veld along the fence where the main flock was kept. Hence it was hardly a fair test, even though they were often seen down in the long grass.

The only *post mortem* that came under my observation, aside from the doubtful case of heartwater, was one of the twenty dosed sheep. It was found on the 15th, one engorged female, and seven others ready for the male being present. Another engorged female was removed on the 17th. The sheep ate and drank sparingly during the 16th and 17th. By noon of the 18th it was very weak, not struggling, at times protruding the tongue while gasping for breath, there being considerable foam in the mouth. It would seem easier for a while and then gasp again. Could not feel the heart-beat distinctly nor determine the temperature for there was no thermometer available. Dead by 5·30 p.m. and left till morning on account of darkness. The lungs and liver were found to be highly congested and almost black; the pericardium was filled with a dark wine coloured fluid; the blood vessels in the auricles as well as in other parts of the heart greatly distended and the whole organ congested and black in appearance. Intestines somewhat inflamed and showed numerous small yellowish knots caused by worms. Kidneys somewhat inflamed and spleen slightly enlarged at one point.

CONCLUSIONS.

1. While the farmers have no doubt about the responsibility of the tick, it is evident that the tick *in itself* is not the *cause* of the disease.
2. There is no conclusive evidence that the tick *conveys* the disease.
3. Dipping in ordinary strength Cooper's dip seems to stop the disease completely.
4. Once dosing with Cooper's dip and salt is not sufficient.
5. One attack does not establish complete immunity.

6. A series of careful experiments are necessary to settle the tick phase of the problem.

It is a pleasure to acknowledge the kindness of Mr. H. D. Gradwell, on whose farm the chief observations were made. He spared neither time, trouble nor sheep and took a keen interest in the investigation. Many of the observations recorded above were reported by him and on investigation were found to be correct and endorsed by the surrounding farmers.

I had the privilege of working with Mr. Borthwick, during the first three days of my investigation. We discussed the situation and I have endeavoured to be accurate and give full credit when referring to any of his observations, some of which were continued by me: *e. g.* immunity after first attack, value of dipping and dosing with Cooper's dip.

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